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(54) **COMPONENT FOR REDUCING MECHANICAL STRESS ON A PCB**

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H05K 7/02 (2006.01)
H05K 7/04 (2006.01)

(52) **U.S. Cl.**
USPC **361/807**; 361/705; 361/760; 361/763; 361/810

(58) **Field of Classification Search**
USPC 361/807–810, 766, 760–763, 700–710, 361/803
See application file for complete search history.

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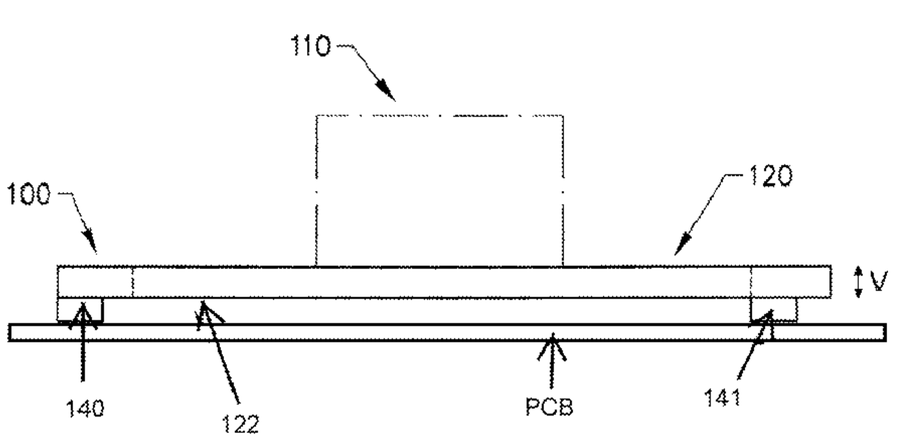
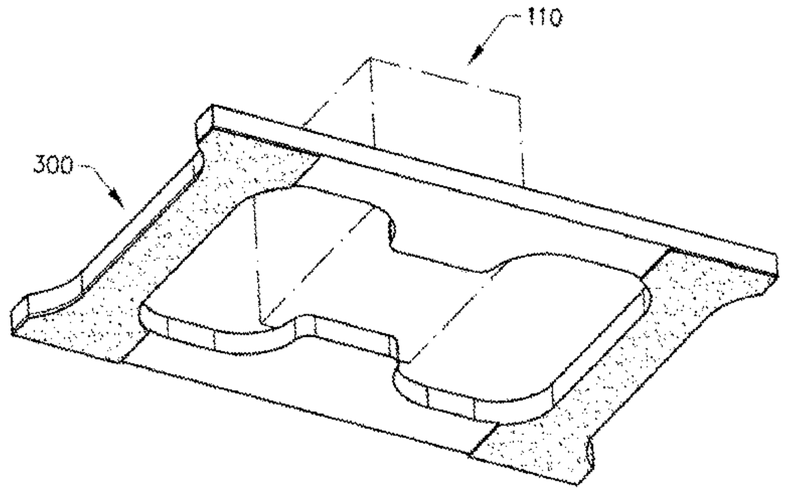
(57) **ABSTRACT**

A component for mounting on a PCB, intended to support an electronics component, with an extension in the longitudinal, lateral and vertical directions. The component has a first and a second main surface, the second main surface being intended for mounting on the PCB. The component is made in a non conducting material, with a first layer of conducting material arranged on its first main surface, the conducting layer being connected to a conducting layer on the second main surface of the component by electrically conducting means. The component's extension in the vertical direction is smaller than its extension in either the longitudinal or lateral direction.

9 Claims, 5 Drawing Sheets





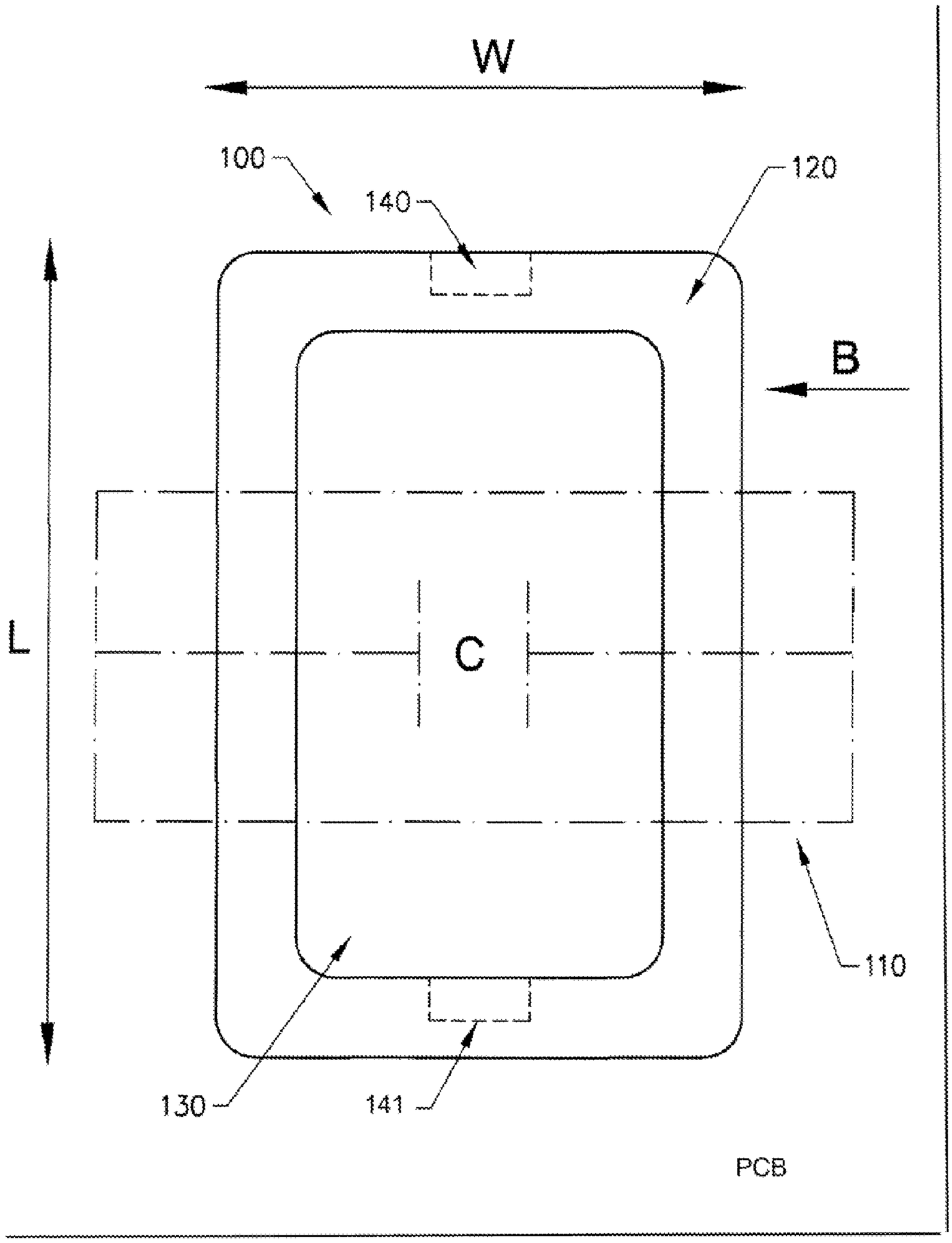


FIG. 1

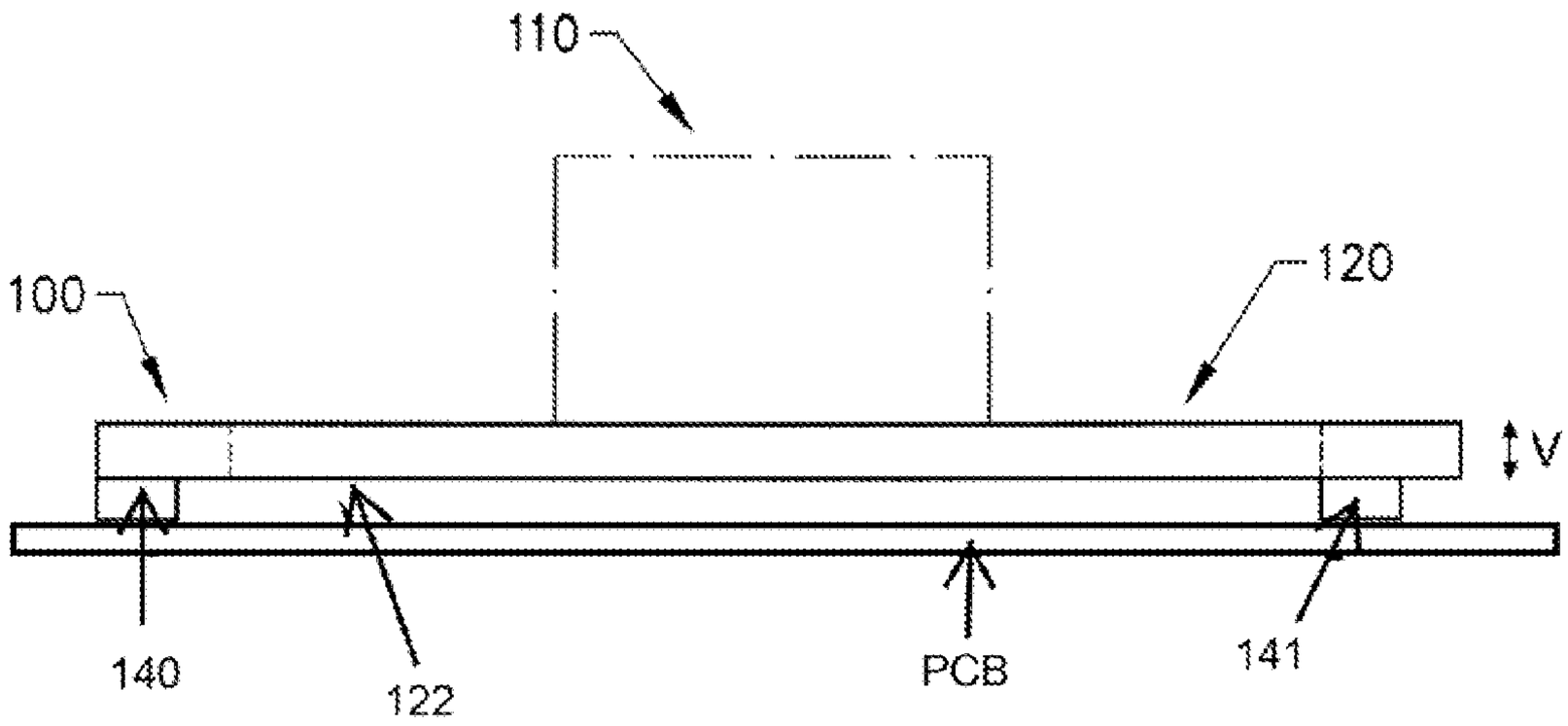


FIG. 2a

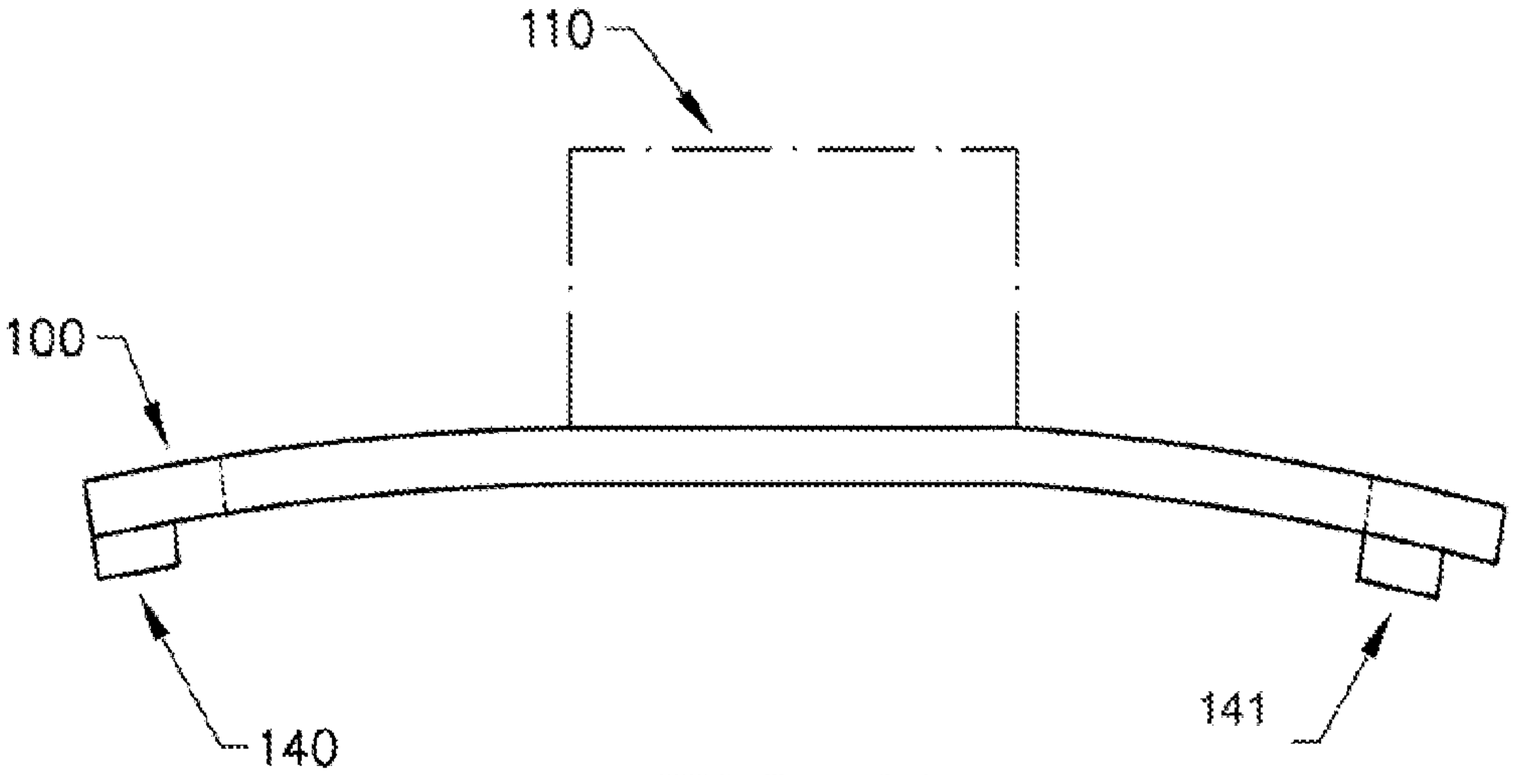


FIG. 2b

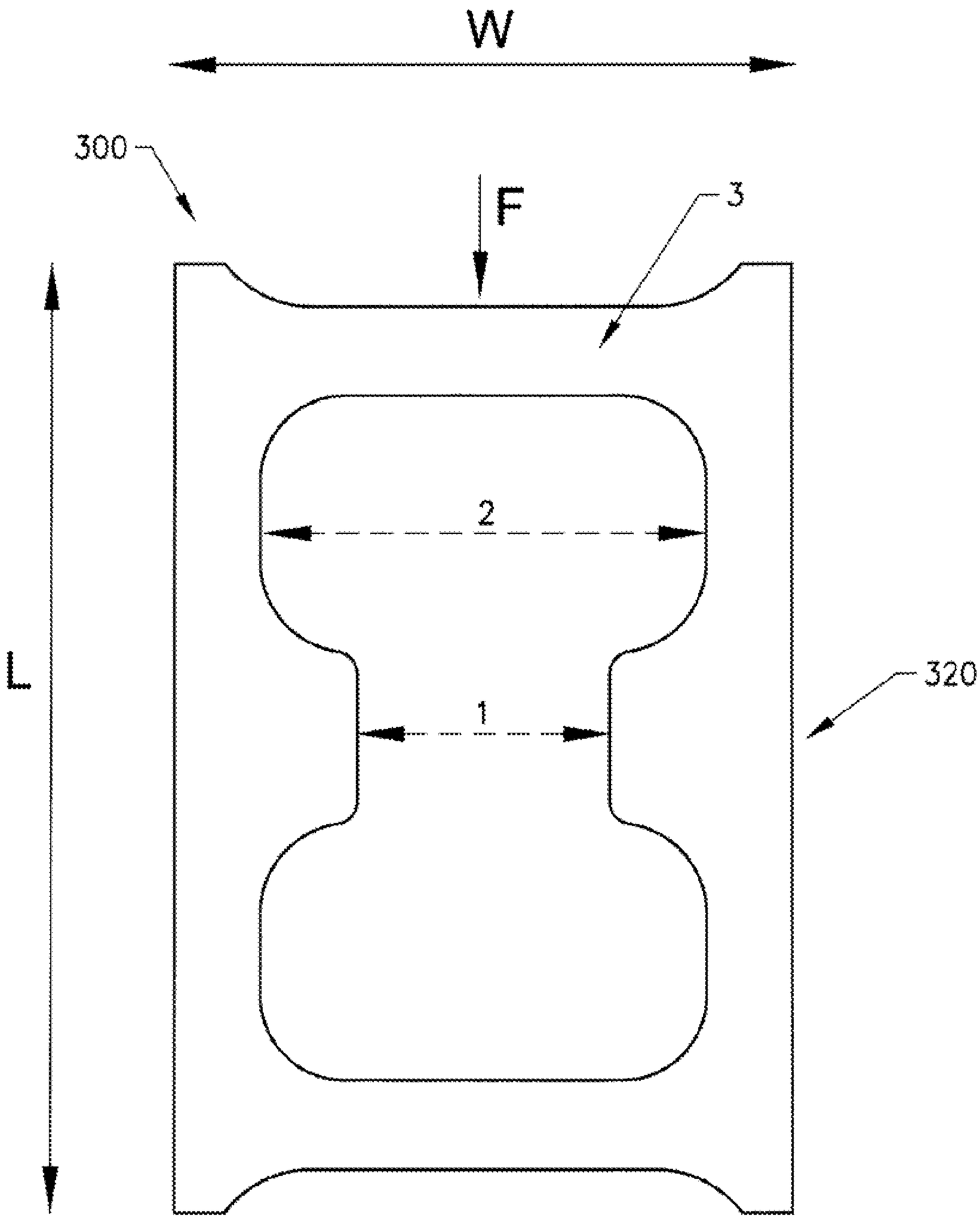


FIG. 3

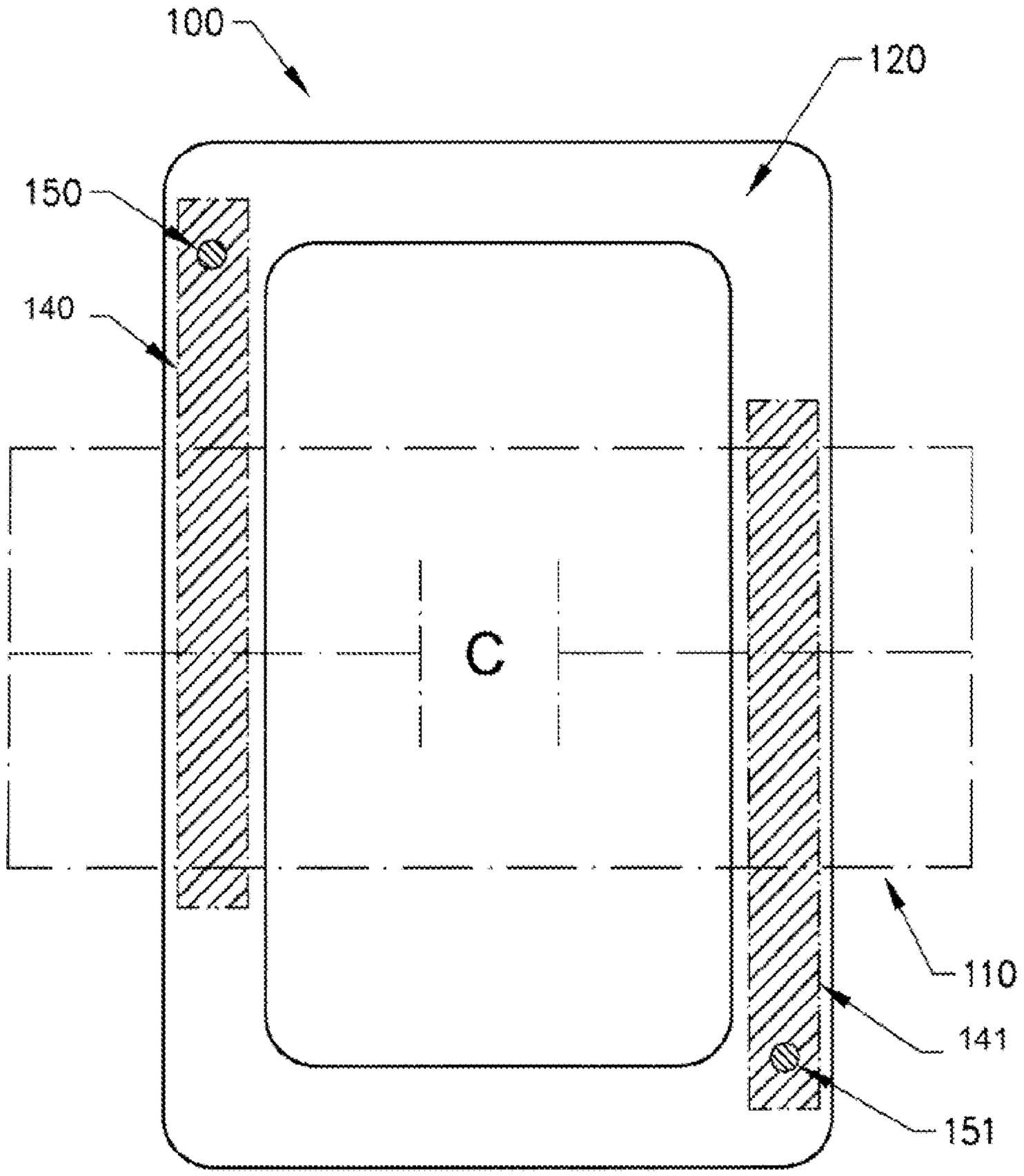


FIG. 4

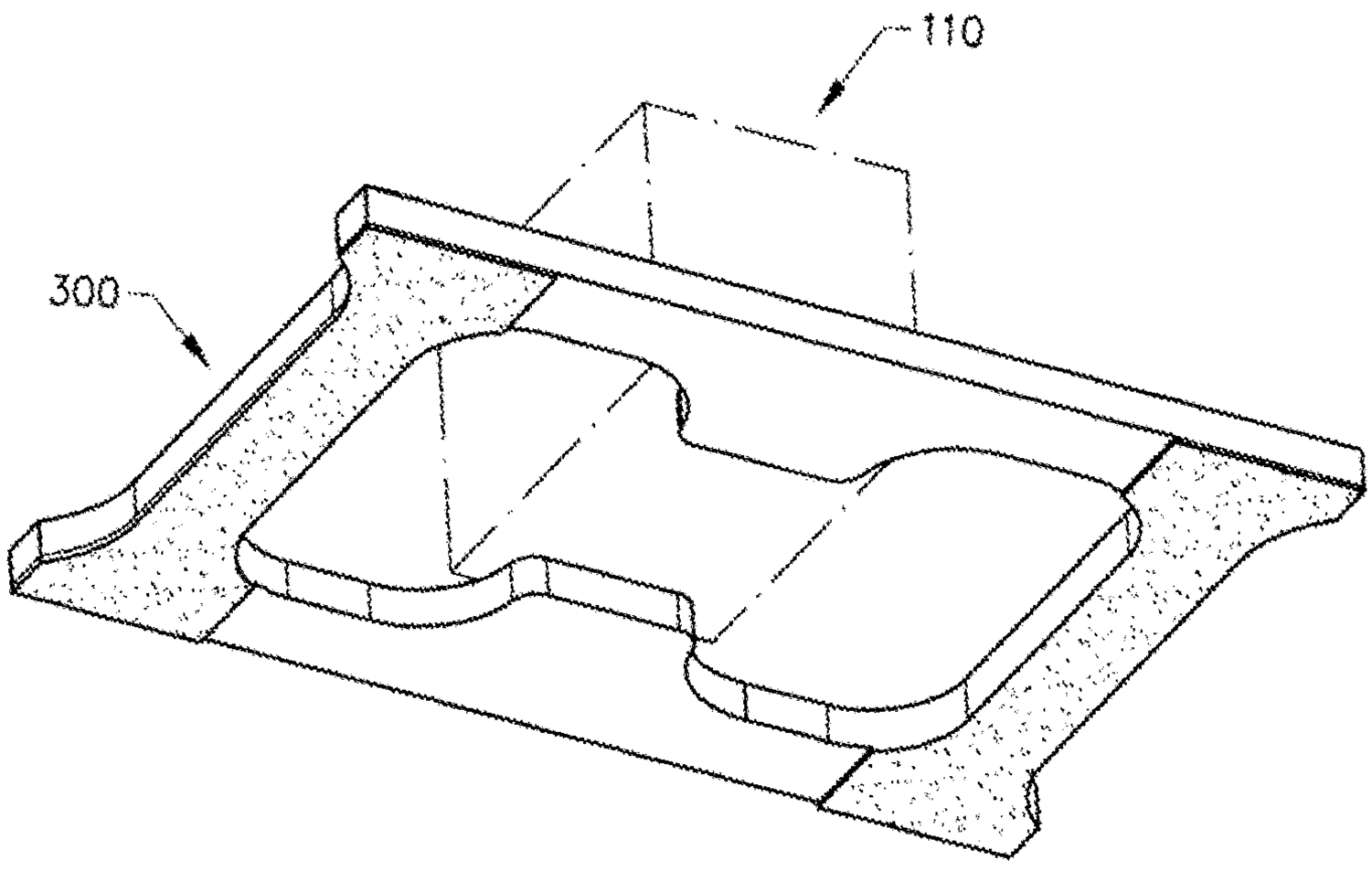


FIG. 5

COMPONENT FOR REDUCING MECHANICAL STRESS ON A PCB

TECHNICAL FIELD

The present invention discloses a component and an assembly by means of which stress in an electronics component due to, for example, heat variations and vibrations or shock may be absorbed.

BACKGROUND

When using electronics components which are made of, for example, ceramic materials, and mounting such components on Printed Circuit Boards, PCBs, differences in thermal expansion factor between the PCB and the component can cause damage to the component, and may in some cases cause the component to break. Also, vibrations due to, for example, shock, may cause damage to the component if the PCB is not able to absorb the shock or vibrations properly.

U.S. Pat. No. 6,310,759 discloses a device by means of which thermal and mechanical stress may be absorbed by a ceramic capacitor. However, it appears that this device is only capable of absorbing stress in one direction, or from one side of the device.

SUMMARY

As has emerged from the explanation given above, it is important to be able to mount an electronics component to a PCB in a way which will make it possible for the component to endure thermal expansion or contraction in the PCB, as well as isolating the component from shock or vibrations caused to the PCB.

A solution to this problem should also be able to absorb thermal or mechanical stress in more than one direction, or from more than one side, and should be possible to use in a standard pick and place machine.

A solution to this is offered by the present invention in that it provides a component for mounting on a Printed Circuit Board, a PCB, the component being intended to support an electronics component.

The component of the invention has an extension in each of the longitudinal, lateral and vertical directions with reference to how the component is intended to be mounted on a PCB, and also has a first main surface and a second main surface, with the second main surface being intended for mounting on a main surface of the PCB. The component of the invention is made of a non conducting material, and has a first layer of conducting material arranged on at least part of its first main surface of the component.

The conducting layer of the component is connected to a second conducting layer on the second main surface of the component by electrically conducting means, and the extension of the component in the vertical direction is smaller than its extension in either of the longitudinal or lateral extensions. The component also exhibits a through-going aperture from the first main surface to the second main surface.

The component's extension in the vertical direction is preferably less than or equal to 0.6 millimeters, but suitably the vertical extension may also be less than 0.3 millimeters.

Thus, in effect, as will be seen even more clearly from the following detailed description, the invention provides a frame for mounting an electronics component on a PCB, the frame being such that it can flex in at least one of the lateral and longitudinal directions, as well as in the vertical direction, by means of which the frame can absorb expansions and contractions and shock in those directions.

As will be realized from the following detailed description, the component of the invention can easily be used by standard pick and place machines.

The invention also discloses an assembly comprising a frame essentially as the one described above, with an electronics component mounted on it.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be described in more detail in the following with reference to the appended drawings, in which

FIG. **1** shows a top view of a component of the invention, and

FIG. **2** shows two side views of the component of FIG. **1**, and

FIG. **3** shows a top view of an alternative component of the invention, and

FIG. **4** shows a more detailed top view of a component of the invention, and

FIG. **5** shows a view of an assembly of the invention.

DETAILED DESCRIPTION

FIG. **1** shows a top view of a component **100** of the invention in a basic first embodiment. As can be seen, the component **100** in this embodiment has an extension in the lateral direction, shown as W in FIG. **1**, as well as an extension in the longitudinal direction, shown as L in FIG. **1**. The terms lateral and longitudinal are not used here in order to restrict the invention in any way, but are merely terms used to facilitate the reader's understanding of the invention. However, for ease of understanding, it will from now on be assumed that the terms longitudinal and lateral are with reference to how the component is intended to be mounted on a PCB.

As will be realized, the component **100** also has an extension in the vertical direction, the term vertical here being used to refer to a direction which is essentially perpendicular to the surface of the PCB on which the component is intended to be arranged.

The component **100** has a first main surface, shown as **120** in FIG. **1**, as well as a second main surface which is not shown in FIG. **1**, but which is the rear surface of the component, and essentially corresponds to the first main surface **120** of the component **100**.

The component is intended for supporting an electronics component, such a component **110** being shown in FIG. **1** with dashed lines. The first main surface **120** of the component **100** is the one on which the electronics component **110** is intended to be mounted, as can be seen from FIG. **1**, and the second main surface of the component is the one intended for mounting on a PCB.

The component **100** is intended to "absorb" contractions, expansions and shock in at least two directions, so that an electronics component **110** which is arranged on a PCB via the component **100** will not sustain damage.

In FIG. **1**, a shock or expansion/contraction in one direction is shown by the arrow marked "B", i.e. a shock or movement perpendicular to the longitudinal extension of the component **100**. In order for the component **100** to be able to absorb a force in the direction "B", the component **100** is designed with a through-going hole **130** in the vertical direction, in effect making the component **100** into a frame on which an electronics component **110** can be arranged. The aperture or hole **130** enables the component **100** to flex in the direction B

in such a way that it "isolates" the electronics component **110** from the force in the direction B.

Also shown in FIG. **1** are attachment points **140**, located on the second main surface of the component **100**, and intended to be used when placing the component **100** on a PCB, so that the component **100** may be soldered to the PCB.

In FIG. **1**, the frame **100** is shown with an elongated form, i.e. the extension in one of the lateral or longitudinal directions is greater than the other, but this is merely one example of an embodiment. The component **100** will also function with other proportions between said two extensions, i.e. the lateral and longitudinal directions.

As mentioned previously, the component **100** is also intended to be able to absorb movements or stress in the vertical direction. This is shown in more detail in FIG. **2***a*: FIG. **2***a* shows the same as FIG. **1**, but seen from one of the sides of the component **100**, for example from the longer side, i.e. from the direction of the arrow "B". The reference numbers from FIG. **1** have been used in FIGS. **2***a* and **2***b* as well in order to denote the same components, parts or features, and the reference numeral **122** has been added to refer to the second main surface of the component **100**.

An arrow "V" is used to illustrate the vertical direction of the component **100**. The attachment points **140** shown in FIG. **1** are also shown in FIG. **2***a*, for the sake of clarity.

FIG. **2***b* shows the component **100** when subjected to a stress or vibration or shock or the like in the vertical direction V. As shown in FIG. **2***b*, the component **100** is designed so that it can "flex" in the vertical direction, this isolating the electronics component **110** from this stress. In order for the component **100** to be able to perform the flexing movement shown in FIG. **2***b*, the component **100** should not have a vertical extension which is too great. A suitable range of values has been found to be a vertical extension below 0.6 millimeters, although in some embodiments it has been preferred to make the component **100** with a vertical extension which is less than 0.3 millimeters.

However, regarding the vertical extension of the component **100**, it has also been found in some applications that it is useful to define the vertical extension as well as the longitudinal and lateral extensions as being such that in an assembly comprising the component **100** and an electronics component **110**, the component **100** exhibits a greater flexibility than the electronics component **110** in the vertical direction and one direction perpendicularly across the assembly, i.e. one of the longitudinal and lateral extensions

More will be said later about how the electronics component is electrically connected to a PCB via the component **100**, but it can be pointed out here that the component **100** should be manufactured in a non conducting material, such as, for example, FR 4 or PTFE.

So far, it has been shown how a component of the invention may be designed so as to absorb contraction/expansion by the electronics component in one of the longitudinal and lateral directions, as well as in the vertical direction. However, it is also possible to enable the component of the invention to absorb stress in both of the longitudinal and lateral extensions, as well as in the vertical direction.

An embodiment **300** of the component of the invention which will fulfill this function is shown in FIG. **3**. The features of the component shown in FIGS. **1** and **2***a* and **2***b* will not be shown in FIG. **3**, but it is assumed that all of these features are present in the embodiment in FIG. **3**, and that the alternatives mentioned above are also possible for the embodiment **300** of FIG. **3**.

The embodiment **300** is thus intended to be able to absorb stress not only in the two directions shown in FIGS. **1** and **2***a* and **2***b*, but also in a third direction, shows with an arrow "F" in FIG. **3**, which is a direction which is essentially perpendicular to the direction of the arrow "B" in FIG. **1**, as well as being perpendicular to the vertical direction "V". It can be pointed out here that the components shown in FIGS. **1**, **2***a*, **2***b* and **3** are also able to absorb stress in directions which are not so directly perpendicular as the arrows F, B and V shown, stress and vibrations can be absorbed in directions which comprise combinations of those directions, thus making the stress non-perpendicular to one or more of the sides or main surfaces of the component of the invention.

Turning now to the embodiment **300** shown in FIG. **3**, it can be seen that in this embodiment, the component **300** is designed with a "waist", i.e. two opposing edges of the component do not have a constant distance between them, as opposed to the embodiment shown in FIG. **1**. In the example in FIG. **3**, it is the longitudinal edges that match this description.

The "waist" feature can also be expressed as saying that if, for example, the longitudinal sides are those that exhibit the "waist", the shortest distance across the component **300** at a first point **1** is smaller than the shortest distance across the component at a second point **2** between said first point and the longitudinal end **3** of the component **300**.

The waist will enable the component **300** to absorb stress in the direction indicated by means of the arrow "F" in FIG. **3**, as well as in the two directions described earlier and also shown in FIGS. **1**, **2***a* and **2***b*.

It will be realized that the concept of a "waist" in the component of the invention can be designed in many different ways within the scope of the present invention. For example, the edges of the component **300** which are shown as essentially straight in FIG. **3**, i.e. the lateral sides, which coincide with the direction of the arrow "W" in FIG. **3**, can also be equipped with "waists".

Furthermore, a waist can be created by making only one of the edges curved, as opposed to making two opposing edges concave, as shown in FIG. **3**. In addition, there may be waists within edges that have waists.

Also, in another embodiment of the invention, the shortest distance across the component **300** at a first point **1** is made larger than the shortest distance across the component at the second point **2** between said first point and the longitudinal end **3** of the component **300**. The desired effect is essentially obtained in this way as well.

Turning now to the electrical connection of the electronics component **110** to a PCB by means of a component of the invention **100**, **300**, FIG. **4** illustrates this. Features or parts which have already been given reference numbers in previous figures have retained their reference numerals in FIG. **4**.

As has been pointed out previously, the component **100** is made from a non conducting material, such as, for example, FR4 or PTFE. The component **110** which is to be arranged on the first main surface **120** of the component **100** thus needs to have a conducting connection to the second main surface **122** of the component, which is the surface that is intended for mounting on a PCB. Accordingly, there is a first layer **140**, **141** of conducting material arranged on at least part of the first main surface **120** of the component **100**, which in FIG. **4** is shown as two separate patches **140**, **141**, of conducting material on the first main surface **120** of the component.

The first layer of conducting material **140**, **141** is connected to a second conducting layer on the second main surface **122** of the component **100** by electrically conducting means such as, for example, plated via holes, shown as **150** and **151** in FIG. **4**. Naturally, the number of conducting means such as via holes and patches shown in FIG. **4** are merely examples,

the number of such means can be varied more or less freely within the scope of the present invention. Alternatives to the plated via holes **150**, **151**, can, for example, be edge plating or wiring.

It can be pointed out that the position of the first conducting layer **141**, **141** on the first main surface **120** of the component should be such that they coincide with the positions of "contact points" on the component **110**, if there are distinct such points on the component.

Finally, FIG. **5** shows a side view from below of an assembly of the invention, with an electronics component **110** arranged on the component **300** from FIG. **3**.

The invention is not restricted to the examples of embodiments shown in the drawings and described above, but may be freely varied within the scope of the appended claims.

For example, it can be pointed out that although the electrical component which can be mounted on a PCB by means of the invention can be a component of more or less any kind, i.e. an IC chip, a resistor, a capacitance, an inductance or any combination of these, although the component **110** for the reader's understanding has been shown with the letter "C" throughout the drawings.

It should also be pointed out that the invention relates to the component **100**, **300** as such, as well as to a complete assembly, i.e. the component **100**, **300**, with an electronics component arranged on it, for example as shown in FIG. **5**.

The invention claimed is:

1. A component for mounting on a printed circuit board (PCB) said component being intended to support an electronics component and absorb thermal and/or mechanical stress in the PCB, the component comprising:

an extension in each of the longitudinal, lateral and vertical directions with reference to how the component is mounted on a PCB,

a first main surface and a second main surface, wherein said electronics component is mounted in direct contact on said first main surface, and wherein said second main surface is mounted on a main surface of the PCB,

wherein the component is made in a non conducting material, with a first layer of conducting material arranged on at least part of said first main surface of the component, said first conducting layer being connected to a second conducting layer on the second main surface of the component by electrically conducting means,

wherein the extension in the vertical direction is smaller than the extension in either of the longitudinal or lateral extensions,

wherein the component exhibits a through-going aperture from the first main surface to the second main surface;

wherein the component flexes in at least one of the lateral, longitudinal, and vertical directions in response to at least one of contractions, expansions, and shock in the PCB, said flexing preventing damage to the electronics component; and

wherein the sides of the component extending in the longitudinal direction exhibit a "waist", such that a shortest lateral distance across the component at a first point is smaller than a shortest distance across the component at a second point between said first point and a longitudinal end of the component.

2. The component of claim **1**, wherein extension in the vertical direction is less than or equal to 0.6 millimeters.

3. The component of claim **1**, wherein its extension in the vertical direction is less than or equal to 0.3 millimeters.

4. The component of claim **1**, wherein the area of the aperture is larger than the area of the first main surface.

5. The component of claim **1**, wherein the extension in the longitudinal direction is greater than the extension in the lateral direction.

6. An assembly comprising:

an electronics component arranged on a second component,

said second component mounting the assembly on a printed circuit board (PCB),

said second component having an extension in each of the longitudinal, lateral and vertical directions with reference to how the assembly mounted on the PCB,

the second component also having a first main surface and a second main surface, wherein said electronics component is mounted in direct contact on said first main surface, and wherein said second main surface is mounted on a main surface of the PCB,

wherein the second component is made in a non conducting material, with a first layer of conducting material arranged on at least part of said first main surface of the second component, said first conducting layer being connected to a second conducting layer on the second main surface of the second component by electrically conducting means,

wherein the second component exhibits a through-going aperture from the first main surface to the second main surface, such that the area of the aperture is larger than the area of the first main surface,

wherein the second component exhibits a greater flexibility than the electronics component in the vertical direction and one direction perpendicularly across the assembly;

wherein the second component flexes in at least one of the lateral, longitudinal, and vertical directions in response to at least one of contractions, expansions, and shock in the PCB, said flexing preventing damage to the electronics component; and

wherein the sides of the second component extending in the longitudinal direction exhibit a "waist", such that a shortest lateral distance across the component at a first point is smaller than a shortest distance across the component at a second point between said first point and a longitudinal end of the component.

7. The assembly of claim **6**, further wherein the extension of the second component in the vertical direction is less than or equal to 0.6 millimeters.

8. The assembly of claim **6**, further wherein the extension of the second component in the vertical direction is less than or equal to 0.3 millimeters.

9. The assembly of claim **6**, wherein the extension of the second component in the longitudinal direction is greater than its extension in the lateral direction.

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